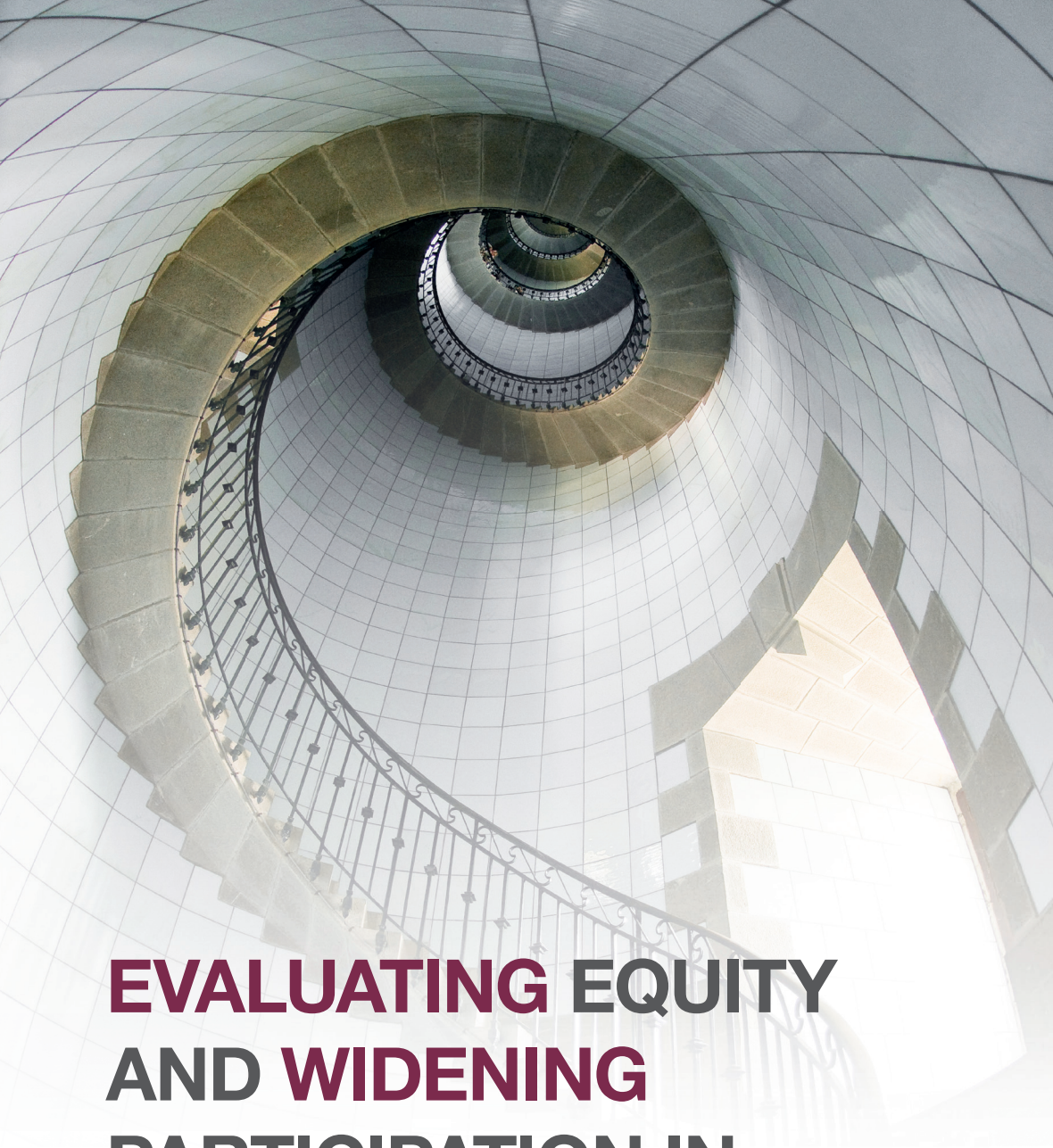

EVALUATING EQUITY AND WIDENING PARTICIPATION IN HIGHER EDUCATION

EXTRACT: CHAPTER 4

Edited by Penny Jane Burke,
Annette Hayton, and Jacqueline Stevenson

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Trentham Books is an imprint of UCL IOE Press

First published in 2018 by the UCL Institute of Education Press, University of London, 20 Bedford Way, London WC1H 0AL

www.ucl-ioe-press.com

British Library Cataloguing in Publication Data:
A catalogue record for this publication is available from the British Library

ISBNs

978-1-85856-703-7	paperback
978-1-85856-858-4	PDF eBook
978-1-85856-864-5	ePub eBook
978-1-85856-865-2	Kindle eBook

Typeset by Quadrant Infotech (India) Pvt Ltd
Printed by CPI Group (UK) Ltd, Croydon, CR0 4YY
Cover image © Hemis/Alamy Stock Photo

Chapter 4

Admission to medicine and law at Russell Group universities: The impact of A-level subject choice

Catherine Dilnot and Vikki Boliver

Introduction

In recent years there has been a growing political desire to widen access not just to higher education generally but to the United Kingdom's most academically selective universities in particular (Sutton Trust and BIS, 2009; BIS, 2015; DfES, 2003). There is clear evidence that the type of university attended and the subject studied can make a considerable difference to future earnings (Britton *et al.*, 2016; Chevalier and Conlon, 2003; Hussain *et al.*, 2009; Walker and Zhu, 2011), with subjects related to professional careers, such as medicine and law, commanding particularly high premiums (Britton *et al.*, 2016). Less privileged graduates remain less likely to access professional careers (Macmillan *et al.*, 2015), with particularly large socio-economic gradients observed in medicine and law (Macmillan, 2009; Milburn, 2009; Milburn, 2012) . In the third of top law firms publishing social mobility data, some 40 per cent of graduate entrants come from private schools (Ashley *et al.*, 2015), as do 38 per cent of trainee doctors (Milburn, 2012). For aspiring lawyers, the socio-economic make-up of the profession reflects the universities and degree subjects from which graduates are recruited (Ashley *et al.*, 2015). Although having a law degree is not essential for access to the legal profession, the majority of those becoming solicitors or training for the bar are admitted with a law degree (Bar Standards Board, 2015; Law Society, 2015). For those wishing to become doctors and dentists, the university dental and medical schools themselves act as gatekeepers to the profession.

Although 90 per cent of entrants to universities in England and the wider United Kingdom in 2014/15 previously attended state-funded secondary schools (HESA, 2015), fewer than 70 per cent of English

students entering medical and dental school with three A levels in three recent cohorts were from state schools. Excluding those from selective state grammar schools, the proportion falls to just 46 per cent (Steven *et al.*, 2016). The proportion of law students from English state schools at UK universities is very similar to the national average for all subjects, but state school students are underrepresented on law degrees at the highly selective Russell Group universities, where just 78 per cent of law students come from state maintained schools and colleges.

A large part of the reason for this disparity is that state school pupils are less likely than their privately educated peers to achieve the high grades required for entry to selective subjects such as medicine and law, and to high tariff universities such as Russell Group institutions (Sutton Trust and BIS, 2009). But there is also mounting evidence that selective universities are less likely to offer places to applicants from state schools than to private school applicants, even when they have the same A-level grades (Boliver, 2013; Noden *et al.*, 2014; Boliver, 2016). Work to date has examined the significance of grades, but has paid only superficial attention to the A-level subjects taken by applicants. This is a potentially important limitation of prior research because, according to the Director General of the Russell Group, Wendy Piatt:

> Many good students haven't taken the subjects needed for entry and universities need students not only to have good grades but grades in the right subjects for the course they want to apply for. This is precisely why we publish *Informed Choices*, a guide which gives pupils information on choosing the right subjects at school for different degree courses. (Quoted in Ward, 2015)

Similarly, the Russell Group's recent publication *Opening Doors: Understanding and overcoming barriers to university access* reports that:

> Admissions staff in several of the most selective universities report that it is commonplace for able candidates to seek places on degrees for which they are not qualified. The Russell Group's online publication *Informed Choices* seeks to address this problem. (Russell Group, 2015b: 5)

While these statements and others like them seem authoritative, a closer look suggests that they rest on anecdotal evidence – 'Admissions staff in several … universities report that it is commonplace …' (Russell Group, 2015b: 5) – rather than being based on a robust statistical analysis of the data. Where statistical data are cited, they tend to amount to circumstantial

evidence – 'We know that independent and selective state school students are much more likely to achieve AAB in two or more facilitating subjects' (Russell Group, 2015b: 28) – rather than evidence directly demonstrating that offer rates are lower for state school applicants *because* they are less likely to have good grades in the subjects required for their chosen course.

The fact that certain degree courses have particular subject prerequisites, and that certain subjects are more generally favoured by universities than others, is evident from the Russell Group's *Informed Choices*, referred to in the earlier quote (Russell Group, 2015a). This guide, which first appeared in 2011, provides prospective university applicants with information about which advanced level subjects are typically considered 'essential' and 'useful' for particular degree courses. *Informed Choices* also identifies eight so-called 'facilitating subjects' that are 'required more often than others' for entry to degree courses at Russell Group universities and so keep 'a much wider range of options open' to applicants still deciding which subject to pursue at university (Russell Group, 2015a: 26, 28). These 'facilitating subjects' are biology, chemistry, English literature, history, geography, languages, mathematics, and physics. The importance of these eight subjects for gaining access to highly selective universities in the UK is underscored by the fact that the Department for Education has introduced a performance indicator for providers of education for 16–19-year-olds that measures the percentage of students obtaining AAB or above at A level, including at least two 'facilitating subjects' (DfE, 2016).

Although it seems clear that certain subjects matter for entry to particular degree courses, no study to date has directly tested the proposition that school type differences in offer rates for applicants with identical grades at A level are substantially diminished once we consider whether those grades were achieved in subjects formally required for their chosen degree programme. A related proposition is that differences in offer rates by school type of competitive degree courses with no specific subject requirements are diminished when subject choice is taken into account, because certain subjects are informally preferred, despite the lack of explicit guidance from universities. In this chapter we set out to test these propositions, by analysing anonymized individual-level data provided by the Universities and Colleges Admissions Service (UCAS) relating to applicants seeking places on degree courses in medicine (as an example of a subject with relatively prescriptive subject requirements) and law (as a subject without specific subject requirements) at Russell Group universities in 2010, 2011 and 2012. As we explain later in the chapter, our ability to provide a definitive answer to our research question is limited by the restricted nature of the data currently

available to researchers (Machin, 2015). But insofar as our data will allow, we find that, while the combinations of grades and subject choices at A level do influence an applicant's chances of admission to a Russell Group university, substantial differences in offer rates by school type remain after this is taken into account.

We commence with a review of previous literature regarding school type differences in the take-up of different A-level subjects, and the impact of A-level subject choices on university admission chances. We then discuss the existing evidence in relation to admission to medicine and law degrees in the UK. We then go on to set out our research questions and describe the dataset and analytical strategy we use to answer them. Finally, we present our main results and discuss their implications.

School type and A-level subject choices

We begin by considering the evidence that state school students are less likely than their privately educated peers to take so-called 'facilitating subjects' at A level. According to official statistics for 2013/14, just 8.7 per cent of state school pupils achieved AAB or above at A level in two or more facilitating subjects – currently a school performance metric and social mobility indicator – compared to 22.6 per cent of private school students (Deputy Prime Minister's Office, 2015). Importantly, this large gap is due mainly to school type differences in achieved grades rather than to differences in subject choices. Looking at the percentages who achieved AAB or above at A level in any subjects, the figures were similarly disparate: 17.4 per cent for state school students and 42.6 per cent for private school students. Among those who achieved AAB or better at A level, in contrast, the percentages of state and private school students with at least two facilitating subjects are more similar, 77.6 per cent and 82.9 per cent respectively. So while private school students do indeed tend to study more facilitating subjects than state school students, the difference is modest at the upper end of the achievement spectrum. Among high achievers, family socio-economic background seems to matter more than school type for A-level subject choice. A longitudinal study of 3,000 students followed since age 3 has found that 'bright' students from disadvantaged homes are much less likely to take at least one facilitating A-level subject than their comparably 'bright' but socio-economically more advantaged peers, at 33 per cent compared to 58 per cent (Sammons *et al.*, 2015).

Research focusing on the specific subjects chosen by A-level students has found that private school students are more likely to take maths, biology, chemistry and physics – all facilitating subjects – than state school

and college students (Vidal Rodeiro, 2007). The patterns are similar when comparing students from different socio-economic backgrounds. The children of higher managers and lower managers/professionals are significantly less likely to take at least two science subjects than the children of higher professionals, while the children of higher managers are more likely to take (non-facilitating) business-related subjects such as accounting, business and economics, and manual workers' children are significantly less likely to take a (facilitating) foreign language A level (Vidal Rodeiro, 2007). Other studies have shown that students eligible for free school meals are significantly less likely than their more privileged peers to take maths and science at A level (Gorard and See, 2009; Gorard *et al.*, 2008); that the probability of taking A-level physics is lower for pupils living in areas with low car ownership even after controlling for prior attainment (Gill and Bell, 2013); that there is a similar relationship between socio-economic status and the uptake of A-level maths (Cheng *et al.*, 1995); and that the number of facilitating subjects taken by students varies by background measured using the Income Deprivation Affecting Children Index (Gill, 2015a).

School type and socio-economic group differences in subject choice are of course likely to be mediated by differences in prior attainment. Students with high prior attainment in the General Certificate of Secondary Education (GCSE) are more likely to choose maths and science subjects at A level (Gill and Bell, 2013; Vidal Rodeiro, 2007), and conversely the lower their scores at GCSE the more likely students are to choose newer or vocational subjects (Vidal Rodeiro, 2007), which are non-facilitating and often have lower prior attainment requirements for enrolment. Some of the raw difference in uptake of these subjects by school type is therefore likely to be linked to differences in the mean attainment levels of their students (Crawford, 2014). Dilnot (2015) has developed a taxonomy of A levels, categorizing them according to the published preferences of Russell Group universities as facilitating, useful, 'less suitable' and non-counting. Using this taxonomy, she shows that for state school students the gap between the top and bottom quintiles by socio-economic status (SES) in choice of at least two facilitating subjects and in choice of two 'less suitable' subjects is explained by differential prior attainment in scores achieved at GCSE and in differential GCSE subject choices, made at age 14 (Dilnot, 2016).

School type differences in A-level subject choices have also been attributed to poorer advice and guidance in state schools, leading to state school students choosing suboptimal A-level subjects for degree courses they wished to apply for – as the Russell Group's recent report on

barriers to university access implies (Russell Group, 2015b). Considerable differences in the amount of general university admissions advice and guidance given by school type were found in a study of high-achieving applicants: students from private schools received more advice than those from grammar schools, followed by state maintained schools, sixth form colleges and finally further education colleges (UCAS, 2012). An ex post survey of students also suggests that almost a quarter of all students were unhappy with the quality of information advice and guidance on A-level subject choice that had been available to them, and that non-traditional applicants were among those most dissatisfied with the quality of advice they received (Student Room, 2014).

A further possible reason for school type differences in A-level subject choices is school type differences in subject availability. Private and selective state grammar schools have been shown to offer fewer 'non-traditional' (and so non-facilitating) subjects than non-selective state schools and colleges (Vidal Rodeiro, 2007). The Sutton Trust suggests that non-selective schools and colleges introduced a disproportionate number of non-facilitating subjects in the 15 years from the mid-1990s in order to appeal to a wider range of pupils (Sutton Trust, 2011), although the balance has subsequently changed (Deputy Prime Minister's Office, 2015). Among facilitating subjects, a recent analysis of A-level provision by school type shows much higher proportions of traditional modern and classical languages offered at independent schools and selective state grammar schools than at comprehensives and academies, although similar proportions offer maths, sciences, history and geography (Gill, 2015b). A review of the literature in the context of uptake of science, technology, engineering and mathematics (STEM) subjects suggests that a range of other school-level characteristics may play a part in the decisions schools make about which subjects to offer at A level, including whether the school is girls only, boys only, or mixed sex; the vision of school leaders and managers; the selectivity of A-level entry policies; and the availability of specialist teachers (Bennett *et al.*, 2013).

A second important question to ask of the existing literature is what impact A-level subjects are known to have on university admission chances and on school type differences therein. One possibility is that having more facilitating subjects increases the chances of admission for applicants with otherwise equivalent A-level grades. This prediction is in line with *Informed Choices*, which suggests taking two facilitating subjects for students who have not yet decided on their degree course in order to keep their options open (Russell Group, 2015a), and with the official school performance

metric and social mobility indicator, which also favours two facilitating subjects. Crawford (2014) takes account of the number of facilitating subjects at each grade in her study of secondary school characteristics and university participation outcomes, and concludes that having high grades in facilitating subjects matters, with each facilitating subject at grade A or above increasing the probability of high status university attendance by 1.8 percentage points controlling for other prior attainment at age 11, 16 and 18.

Other studies have explored the effects of having studied individual facilitating subjects on the chances of being offered a place at a highly selective university (Boliver, 2013; Boliver, 2016; Chowdry *et al.*, 2013) and have found positive effects for all but one facilitating subject, the exception being English literature. Importantly, these studies find that school type gaps in admission and participation rates remain after controlling for individual facilitating subjects. However, these studies are limited because they do not investigate the effect of having different combinations of facilitating subjects, or of any interaction between the number of facilitating subjects and grades.

A further limitation of the existing literature is that there has been no consideration of whether having facilitating subjects improves university admission chances because these subjects are required preparation for particular degree courses, rather than because they are esteemed by university admissions tutors as good general preparation for study at degree level. Noden *et al.* (2014) examine A-level subjects in their study of ethnic differences in university offer rates. They find that many subjects are associated with increased chances of receiving an offer for some courses but decreased chances for others, suggesting that the specific preparation mechanism is important. But rather than interacting all subjects with all degree programmes in their models, they use three categories of 'difficulty' of A level, drawing on the work of Coe *et al.* (2008). All but two of the facilitating subjects considered by Coe *et al.* are classified as above average 'difficulty', and five of them (maths, further maths, chemistry, biology and physics) are the most difficult of the 33 subjects examined. The two below average 'difficulty' are English literature and geography. Noden *et al.* (2014) find higher 'difficulty' A levels (in whatever subject) to be positively associated with chances of receiving an offer. This adds weight to the idea that facilitating subjects help applicants achieve offers not only in meeting course requirements, but also through the esteem in which they are held. This hypothesis can be tested by comparing the chances of gaining an offer to specific degree courses with highly prescriptive requirements (in our

example, medicine) with those for similarly competitive courses with no course-specific requirements (in our case, law).

Admission to undergraduate medical degrees

The medical profession has for some decades been concerned about equality and diversity (BMA, 2009), particularly in terms of social background – concerns echoed in the report of the Panel on Fair Access to the Professions (Milburn, 2009) – and therefore with the admissions processes of medical schools as gatekeepers (McManus, 1998; Medical Schools Council, 2014; Patterson *et al.*, 2016). The social gradient of recent cohorts of students at medical school is a consequence not just of the pattern of applications, but also the lower odds of admission for less privileged and non-selective state school students compared with their more privileged and private or grammar school educated peers (Mathers *et al.*, 2016; Steven *et al.*, 2016). The use of A levels in selection, known to favour students from more privileged backgrounds (Schwartz, 2004), has been identified as problematic (Patterson *et al.*, 2016). Aptitude tests (UK Clinical Aptitude Test (UKCAT) or BioMedical Admissions Test) are now used by all Russell Group medical schools to inform admissions decisions, in response to concerns about the lack of discriminatory power of A levels at the high end of the attainment distribution (McManus *et al.*, 2008), and preliminary evidence suggests that these may have had a positive effect on widening participation (Tiffin *et al.*, 2012; Wright and Bradley, 2010). A-level grades remain an important tool for selection, although the role of choice of subjects beyond those required, or within those suggested as alternatives, has not been thoroughly examined, with the exception of some older evidence that having a non-science A level to add balance to applications makes no difference to chances of application success (McManus, 1998).

In response to the criticism from the Commission on Social Mobility that the medical profession was doing too little to address the dearth of medical students from lower SES backgrounds, the Medical Schools Council has published recommendations relating to selection practices, and the monitoring of participation by social background (Medical Schools Council, 2014). While it considers there is still too little evidence for a national framework for selection, it suggests that medical schools should select based on academic attainment, performance in aptitude tests and multiple mini interviews (MMIs). The majority of Russell Group medical schools now publish details of the importance of the various elements of their selection process. In the case of academic attainment, the majority (11) of the Russell Group medical schools in our data use A-level predicted grades and subjects

only as a threshold in shortlisting for interview, although it should be noted that this is the practice for 2016 entry, and may have changed since the cohorts in this study made their applications. In many cases the threshold A-level scores are slightly reduced to take contextual data into account for students from non-traditional backgrounds or underperforming schools. Two universities include predicted (or actual, if available) A-level scores in ranking applicants for shortlisting for interview. For four universities the way A levels are used is unclear. Only one of the 18 universities in our data does not interview 18-year-old applicants, and uses A-level scores as part of the offer ranking. Attainment at GCSE is more widely used in ranking for selection than A-level grades are, with eight universities using achieved GCSE grades in ranking applicants for shortlisting and six using them as thresholds. (For one university the way GCSE scores are used is unclear.)

Medical schools differ considerably in their use of personal statements in admissions, with their weighting in ranking for shortlisting varying from 80 per cent of all factors taken into account to zero. Patterson *et al.* (2016) cast doubt on their predictive validity and reliability in selection, and suggest their use may bias selection decisions. There is evidence that the quality of personal statements differs by school type (Jones, 2013) that is suggestive of a mechanism through which differential offer rates by school type might arise. In the context of medical admissions, and controlling for examination performance once at medical school, coming from a private or grammar school rather than a non-selective maintained school predicted scores given to personal statements on application, particularly for women, but did not predict scores on the UKCAT (Wright and Bradley, 2010).

For the majority of medical schools, the final decision to admit is made on the basis of interviews, with a move towards MMIs, typically a series of scenario-based short interviews or 'stations', and away from the traditional interview. Criticism of interviews in the medical literature has concentrated on their weak association with future academic and clinical performance (Goho and Blackman, 2006; Wright and Bradley, 2010), their lack of both clarity about what they are trying to measure and reliability, and the better predictive validity of MMIs on performance at medical school (Patterson *et al.*, 2016), rather than any consideration of possible differential performance in interview by applicants from different social backgrounds. This aspect is little researched (Patterson *et al.*, 2016), although Wright and Bradley (2010) note that interview scores are not predicted by school type.

Admission to law degrees

The legal profession has also seen recent research into barriers to entry, with the Legal Services Board identifying the importance of early education both through its effect on ability to gain a training contract and on university attended (Sullivan, 2010). Rolfe and Anderson (2003) found some law firms had stronger links with grammar and private schools than with non-selective maintained schools, and younger partners were as likely to be educated privately in 2004 as in 1998 (Sutton Trust, 2009). Although the Legal Services Board discussed the importance of doing the right A-level subjects and going to a prestigious university in general terms, less research attention has been paid to admission to undergraduate law degrees at such universities, with research into fair access instead concentrating on the next step of successfully getting a pupillage at the bar or employment at a law firm (Ashley *et al.*, 2015; Zimdars, 2010), although these studies note the association of getting such positions with having been at a Russell Group university, and, for the bar, Oxford or Cambridge in particular (Zimdars, 2010). Given that the majority of those entering both branches of the profession have law degrees, and presumably most of those applying to do law at university aim to become lawyers, understanding the barriers to entry to law in particular at university admissions stage is clearly valuable. Like medicine, law is a competitive subject at university with high grades demanded: Russell Group universities standard offers vary from A*AA to ABB. But unlike medicine, specific subjects are not generally required for Russell Group law degrees. A third of Russell Group universities require their applicants to take the Law National Aptitude Test (LNAT), run by the LNAT consortium, which suggests that its use increases the capacity to discriminate between highly qualified applicants, but their analyses are not published. Only Oxford and Cambridge among the Russell Group institutions in our data interview applicants for law.

Research questions, data and methods of analysis

We now turn to assess three key claims: (1) that state school applicants seeking entry to medicine and law at Russell Group universities are less likely than their privately educated peers to have studied the subjects required or preferred for admission, (2) that state school applicants for these courses who have studied the required subjects tend to have poorer grades than their privately educated counterparts, and (3) that offer rates from Russell Group universities for these courses are lower for candidates

from state schools because state school candidates are less likely to have 'the right grades in the right subjects'.

These questions are examined by means of a statistical analysis of anonymized individual-level applications and admissions data for the years 2010–12 supplied by the Universities and Colleges Admissions Service. We take as our unit of analysis applications for entry to Russell Group universities submitted by candidates studying for three or more A levels.[1] We focus first on applications to medicine/dentistry,[2] beginning with a basic bivariate analysis to compare the A-level subject and grade profiles of candidates from private, grammar and non-selective state schools. We then run a series of binary logistic regression models that enable us to compare the marginal probabilities of being offered a place on a medicine/dentistry course at a Russell Group university for candidates from different school backgrounds, both before and after controlling statistically for any differences in A-level subject and grade profiles.[3] We then repeat the entire analysis with a focus on applications to law.

Informed Choices advises that students wishing to study medicine or dentistry at a Russell Group university are generally required to have studied chemistry and biology at A level, and that either maths or physics may also be required or considered useful (Russell Group, 2015a: 39, 43). We therefore distinguish between candidates who have studied chemistry and biology and maths or physics at A level, those who have studied chemistry and biology but not maths or physics, and those who have *not* studied one or both of chemistry and biology. We further disaggregate these three A-level subject profiles in relation to achieved grades at A level, distinguishing between those whose best three grades range from three A stars to three B grades or below.

In relation to studying law at a Russell Group university, *Informed Choices* advises that there are no essential A-level subject requirements. It is noted that English (literature) is sometimes required and that history and other facilitating subjects may be considered useful (Russell Group, 2015a: 43). We therefore distinguish between candidates on the basis of how many facilitating subjects they have studied at A level, ranging from 3+ to 0. We further disaggregate these subject profiles in relation to achieved grades at A level, distinguishing between those whose best three grades range from three A stars to three B grades or below. Interestingly, A-level law is not listed as a useful subject when applying for admission to a law degree at a Russell Group university. We suspect that having studied law at A level may in fact put applicants at a disadvantage. We therefore also consider the

impact on admissions chances of whether or not law was studied at A level and if so what grade was achieved.

An important caveat is that, in our data, only the A-level grades actually achieved by applicants are available to us. This is important because students typically apply to university in their final school year, with teachers supplying predicted grades to support applications. Predicted grades are known to vary in their accuracy (UCAS, 2013). For the A levels of one board in 2014, forecast grades were correct only 43 per cent of the time, although 88 per cent were correct within one grade. Of the inaccurate grades, around three times as many were optimistic as pessimistic, with over-optimistic predictions more common for those from comprehensive schools and Further Education colleges than for grammar and private schools (Gill and Benton, 2015). It is possible that part of the difference in offer rates between students with equivalent achieved grades by school type is a result of institutions 'discounting' the predicted grades of students from institutions known to be less accurate with their predictions, but where those students do actually achieve their predictions. Without predicted grades in the dataset (which UCAS does not provide), it is not possible to test this hypothesis.

Results

Table 4.1 shows that around two-thirds of applications to medicine/dentistry courses at Russell Group were submitted by candidates studying for A levels in chemistry and biology (both required subjects) and in maths and/or physics (both considered useful subjects). This was the case regardless of whether the applications came from candidates attending private (69.4 per cent), grammar (72.1 per cent) or non-selective state schools (67.4 per cent). Across all school types, around a quarter of applications were submitted by candidates studying for A levels in chemistry and biology but not also maths and/or physics. Only a small minority of applications (about 5 per cent) were submitted by candidates who did not have one or both of the required A-level subjects, chemistry and biology, again with no substantial difference across school types. Interestingly, A-level grade profiles are fairly similar across school types, although candidates from non-selective state schools are slightly less likely to achieve the highest sets of grades.

Table 4.1: Percentages of applications to courses in medicine/dentistry at Russell Group universities with specified A-level subject and grade profiles, by school type (column percentages)

	Private	Selective state grammar	Non-selective state school
A-level physics & biology, plus maths or physics	69.4	72.1	67.4
A*, A*, A*	9.0	10.1	5.0
A*, A*, A	10.0	10.2	5.8
A*, A, A	11.6	15.7	10.2
A, A, A	17.1	16.0	14.3
A*/A, A*/A, B or below	10.6	11.2	11.6
A*/A, B or below, B or below	5.5	5.2	9.1
B or below, B or below, B or below	5.6	3.7	11.4
A-level physics & biology, but not maths/physics	25.9	24.2	26.9
A*, A*, A*	1.8	1.3	0.6
A*, A*, A	1.8	2.0	2.2
A*, A, A	5.3	3.6	4.0
A, A, A	6.8	6.8	5.2
A*/A, A*/A, B or below	4.5	5.3	5.5
A*/A, B or below, B or below	3.2	3.5	4.4
B or below, B or below, B or below	2.3	1.8	4.8
A levels do not include one or both of physics & biology	4.7	3.5	5.7
A*, A*, A*	0.8	0.2	0.1
A*, A*, A	0.1	0.2	0.1
A*, A, A	1.1	0.7	1.0
A, A, A	1.0	0.7	0.9
A*/A, A*/A, B or below	1.7	1.6	3.6
A*/A, B or below, B or below	0.0	0.0	0.0
B or below, B or below, B or below	0.0	0.0	0.0
N	1,684	1,650	3,447

Note: Based on applications submitted via UCAS in 2010–12 by applicants who achieved 3+ A levels.

Table 4.2 reports the results of a binary logistic regression analysis of the probability that an application to study medicine or dentistry at a Russell Group university is met with an offer of a place. Model 1 shows the marginal probability of being offered a place by school type for students with mean other characteristics (A-level profile, year of application and specific institution applied to). The probability of being offered a place is ten percentage points lower for applicants from non-selective state schools and four percentage points lower for applicants from grammar schools compared to applicants from private schools (offer rates of 12 per cent, 18 per cent and 22 per cent, respectively). The difference between the private school rate and the grammar and non-selective state school rates are significant at 5 per cent confidence levels.

Model 2 shows the odds of being offered a place for candidates with different A-level subject and grade profiles. Here it can be seen that candidates with three A* grades including both chemistry and biology have the highest chances of admissions success, regardless of whether they also have maths and/or physics A level (50 per cent offer rate) or not (48 per cent offer rate). The importance of having both chemistry and biology is evident from the fact that the offer rate is considerably lower for those who lack one or both of these A-level subjects even if they have achieved three A* grades in other subjects (13 per cent). Grades as well as subjects are clearly important: among those with chemistry and biology at A level, the offer rate falls considerably as grades decline from A*A*A (50 per cent) to A*A*A (37 per cent) to A*AA (25 per cent) and so on.

Model 3 includes school type and candidates' A-level profiles in the same model. Comparing Model 1 and Model 3, it is clear that school type differences in offer rates are reduced after taking A-level profiles into account, reflecting the fact that state school applicants are less likely to achieve the top grades than their privately educated counterparts. However, offer rates continue to be five percentage points lower for non-selective state school applicants and four percentage points lower for grammar school applicants compared to applicants from private schools with the same A-level profiles (offer rates of 14 per cent, 15 per cent and 19 per cent, respectively).

Table 4.2: Binary logistic regression models predicting the marginal probabilities of being offered a place on a medicine/dentistry degree programme at a Russell Group university (N=6,781)

	Model 1	Model 2	Model 3
School type			
Private school (reference category)	0.22		0.19
Selective state grammar school	0.18*		0.15*
Non-selective state school	0.12*		0.14*
A-level profile			
Chemistry & biology, plus maths or physics: A*, A*, A* (reference category)		0.50	0.50
Chemistry & biology, plus maths or physics: A*, A*, A		0.37*	0.37*
Chemistry & biology, plus maths or physics: A*, A, A		0.25*	0.25*
Chemistry & biology, plus maths or physics: A, A, A		0.17*	0.17*
Chemistry & biology, plus maths or physics: A*/A, A*/A, B or below		0.14*	0.14*
Chemistry & biology, plus maths or physics: A*/A, B or below, B or below		0.05*	0.06*
Chemistry & biology, plus maths or physics: 3 x B or below		0.03*	0.03*
Chemistry & biology, not maths or physics: A*, A*, A*		0.48	0.46
Chemistry & biology, not maths or physics: A*, A*, A		0.33*	0.34*
Chemistry & biology, not maths or physics: A*, A, A		0.28*	0.28*
Chemistry & biology, not maths or physics: A, A, A		0.19*	0.19*
Chemistry & biology, not maths or physics: A*/A, A*/A, B or below		0.10*	0.10*
Chemistry & biology, not maths or physics: A*/A, B or below, B or below		0.05*	0.05*
Chemistry & biology, not maths or physics: 3 x B or below		0.03*	0.03*
Not chemistry and/or biology: A*, A*, A*		0.13*	0.11*
Not chemistry and/or biology: A*, A*, A		0.57	0.43
Not chemistry and/or biology: A*, A, A		0.26*	0.26*

Table 4.2 continued

	Model 1	Model 2	Model 3
Not chemistry and/or biology: A, A, A		0.32†	0.32†
Not chemistry and/or biology: A*/A, A*/A, B or below		0.02*	0.02*
Chi-square (df)	329 (21)	565 (37)	571 (39)
Log likelihood	–3,401	–3,175	–3,167

Note: Analysis is restricted to applications submitted via UCAS in 2010–12 by applicants who achieved 3+ A levels. All models include controls for year of application and specific institution applied to. Statistically significant differences relative to the reference category are indicated by * ($p < 0.05$) and † ($p < 0.10$).

Table 4.3 shows that around two-thirds of private school and grammar school applicants to law at Russell Group universities have studied two or three facilitating subjects at A level, and only a very small minority have studied only non-facilitating subjects. Private and grammar school applicants are similar with respect to subject choice and with respect to grades achieved, although grammar school applicants are slightly less likely to have achieved the top grades. In contrast, less than half of all non-selective state school applicants studied two or three facilitating A-level subjects, a third studied just one facilitating subject, and more than a fifth studied only non-facilitating subjects. Moreover, non-selective state school applicants are notably less likely than private and grammar school applicants to have achieved top grades. State school applicants are also much more likely to have studied law at A level (44.6 per cent) than applicants from private (2.0 per cent) and grammar (6.2 per cent) schools.

Table 4.3: Percentages of applications to courses in law at Russell Group universities with specified A-level subject and grade profiles, by school type (column percentages)

	Private school	Selective state grammar school	Non-selective state school
Three facilitating subjects	33.1	33.9	14.0
A*, A*, A*	3.2	2.3	0.4
A*, A*, A	7.1	2.9	1.8
A*, A, A	6.8	5.5	1.5
A, A, A	2.9	7.8	2.0
A*/A, A*/A, B or below	8.1	8.4	3.6
A*/A, B or below, B or below	2.6	3.6	2.1
B or below, B or below, B or below	2.6	2.4	2.6

	Private school	Selective state grammar school	Non-selective state school
Two facilitating subjects	46.0	42.4	29.0
A*, A*, A*	1.7	2.3	0.5
A*, A*, A	5.3	5.2	2.4
A*, A, A	11.4	5.0	4.0
A, A, A	8.2	7.9	3.3
A*/A, A*/A, B or below	11.4	13.4	9.0
A*/A, B or below, B or below	5.3	5.2	4.6
B or below, B or below, B or below	2.7	3.5	5.1
One facilitating subject	16.7	16.6	34.7
A*, A*, A*	0.2	0.0	0.5
A*, A*, A	0.5	0.6	3.1
A*, A, A	1.4	0.5	0.9
A, A, A	3.8	3.5	4.4
A*/A, A*/A, B or below	4.4	5.0	8.9
A*/A, B or below, B or below	4.1	3.2	8.5
B or below, B or below, B or below	2.4	3.8	8.5
No facilitating subjects	4.0	8.2	22.2
A*, A*, A*	0.0	0.6	0.6
A*, A*, A	0.0	1.1	1.0
A*, A, A	1.8	1.1	2.0
A, A, A	0.0	1.5	2.5
A*/A, A*/A, B or below	0.3	2.1	4.4
A*/A, B or below, B or below	0.8	0.6	4.8
B or below, B or below, B or below	1.1	1.2	7.0
Law A level	2.0	6.2	44.6
A*	0.0	2.4	9.5
A	0.6	2.1	19.2
B or below	1.4	1.7	15.8
N/A	98.0	93.8	55.4
N	658	658	2,613

Note: Based on applications submitted via UCAS in 2010–12 by applicants who achieved 3+ A levels.

Model 1 of table 4.4 shows that, while applicants from grammar schools are just as likely as private school applicants to be offered places on law courses at Russell Group universities (offer rates of 86 per cent and 87 per cent,

respectively), applicants from non-selective state schools are much less likely to be offered places (a statistically significantly different offer rate of 55 per cent).

Model 2 shows that, among applicants with three facilitating subjects at A level, grades of AAA or better virtually guarantee an offer of a place on a law programme at a Russell Group university (offer rates of 98–9 per cent). Applicants with one or two facilitating subjects are also virtually guaranteed to be offered a place provided they have the highest possible grades of A*A*A* (offer rates of 97–9 per cent). Offer rates are notably lower for those whose three facilitating subjects include at least one B grade (19–90 per cent), and for those with one or two facilitating subjects at anything less than A*A*A* (10–96 per cent). Applicants with no facilitating subjects at A level have the lowest offer rates at all grade levels (6–92 per cent).

Model 3 includes both school type and A-level profile as predictors of admissions chances. The difference in offer rates for those from grammar as compared to private schools remains non-statistically significant (offer rates 78 per cent compared to 80 per cent). The difference in offer rates for those from non-selective state schools as compared to private schools is substantially reduced, but remains large and statistically significant at ten percentage points.

Finally, Model 4 adds law A level to the model. This shows that holding an A level in law yields no advantage whatsoever with respect to admissions chances, with the probability of admission being essentially the same for those without law A level as for those with an A* in that subject (offer rates of 76 per cent and 77 per cent, respectively). In this final model, the difference in offer rates for those from non-selective state schools as compared to private schools reduces slightly to seven percentage points and is now statistically significant at only the 0.10 level (offer rates of 71 per cent and 78 per cent, respectively). Taken together, these findings indicate that a significant proportion of law degree applicants from non-selective state schools may be wasting an A level by studying A-level law from the point of view of Russell Group law degree admission, and those achieving lower than a B in law A level are actually at a disadvantage, compared with similar students without law at all (62 per cent offer rate compared with 76 per cent)

Table 4.4: Binary logistic regression models predicting the marginal probabilities of being offered a place on a law degree programme at a Russell Group university (N=3,929)

	Model 1	Model 2	Model 3	Model 4
School type				
Private school (reference category)	0.87		0.80	0.78
Selective state grammar school	0.86		0.78	0.77
Non-selective state school	0.55*		0.70*	0.71†
A-level profile				
Three facilitating subjects: A*A*A*		0.99	0.99	0.99
Three facilitating subjects: A*, A*, A		0.99	0.99	0.99
Three facilitating subjects: A*, A, A		0.98	0.98	0.97
Three facilitating subjects: A, A, A		0.98	0.98	0.98
Three facilitating subjects: A*/A, A*/A, B or below		0.90*	0.89*	0.88*
Three facilitating subjects: A*/A, B or below, B or below		0.73*	0.72*	0.69*
Three facilitating subjects: B or below, B or below, B or below		0.19*	0.20*	0.19*
Two facilitating subjects: A*, A*, A*		0.99	0.99	0.99
Two facilitating subjects: A*, A*, A		0.96*	0.96†	0.95†
Two facilitating subjects: A*, A, A		0.94*	0.94*	0.93*
Two facilitating subjects: A, A, A		0.91*	0.90*	0.90*
Two facilitating subjects: A*/A, A*/A, B or below		0.82*	0.82*	0.81*
Two facilitating subjects: A*/A, B or below, B or below		0.70*	0.69*	0.68*
Two facilitating subjects: B or below, B or below, B or below		0.14*	0.14*	0.14*
One facilitating subject: A*, A*, A*		0.97	0.97	0.97
One facilitating subject: A*, A*, A		0.89*	0.90*	0.89*
One facilitating subject: A*, A, A		0.96†	0.96	0.95
One facilitating subject: A, A, A		0.85*	0.86*	0.86*
One facilitating subject: A*/A, A/A, B or below		0.71*	0.72*	0.73*
One facilitating subject: A*/A, B or below, B or below		0.36*	0.37*	0.39*
One facilitating subject: B or below, B or below, B or below		0.10*	0.11*	0.11*

Table 4.4 continued

	Model 1	Model 2	Model 3	Model 4
No facilitating subjects: A*, A*, A*		0.92†	0.92†	0.90†
No facilitating subjects: A*, A*, A		0.83*	0.84*	0.85*
No facilitating subjects: A*, A, A		0.83*	0.83*	0.83*
No facilitating subjects: A, A, A		0.60*	0.63*	0.67*
No facilitating subjects: A*/A, A*/A, B or below		0.64*	0.66*	0.71*
No facilitating subjects: A*/A, B or below, B or below		0.28*	0.30*	0.35*
No facilitating subjects: B or below, B or below, B or below		0.06*	0.07*	0.09*
Law A level				
Law A-level: A* (reference category)				0.77
Law A level: A				0.66
Law A level: B or below				0.62*
No law A level				0.76
Chi-square (df)	339 (22)	410(47)	413(49)	414(52)
Log likelihood	–1,891	–1,582	–1,578	–1,572

Note: Analysis is restricted to applications submitted via UCAS in 2010–12 by applicants who achieved 3+ A levels. All models include controls for year of application and specific institution applied to. Statistically significant differences relative to the reference category are indicated by * ($p < 0.05$) and † ($p < 0.10$).

Discussion and conclusion

We first address the question of whether part of the admissions gap by school background is accounted for by students applying for courses without the appropriate subjects at A level. We find little evidence for this for those applying for medicine and dentistry. Very similar proportions of those applying from private, grammar and non-selective state schools have at least chemistry and biology A levels, which would fulfil the A-level criteria of all of the Russell Group medical schools. This evidence for medicine and dentistry cannot be generalized to other subjects with prescriptive course requirements: arguably those applying for medicine are likely to be highly aware of subject requirements as part of the long list of elements in their selection. Compared with many other subjects, applying for medicine and dentistry requires considerable forward planning (for example, because of the work experience requirement and the early UCAS deadline). A-level students applying for courses where forward planning might be thought less important but with essential subject requirements may realize late that their

A-level subject choices are inappropriate, but might think it worth applying anyway. This may conceivably vary by school type (perhaps because of differentials in the quality of information, advice and guidance on A-level subject choice), but this question remains to be answered for courses with prescriptive A levels outside medicine and dentistry.

The patterns in application success for medicine and dentistry by A-level subject and grade observed are interesting. Although for current applicants, the standard offer at Russell Group universities varies from AAA to A*A*A* (and if anything has increased since the cohorts in these data), dropping even one A* for the cohorts in this data significantly reduces the chances of admission. It seems that although standard offers are generally AAA and above, in practice those shortlisted for interview and progressing through the selection process are likely to exceed the minimum offer. The highest grades at A level are likely to be highly correlated with other measures of attainment (aptitude tests and GCSEs), which, as discussed earlier, are often scored and used in shortlisting students for interview. Having a third science subject (maths or physics) in addition to biology and chemistry slightly increases the chances of admission if one A* grade is dropped, but overall the choice of a third A-level subject seems unimportant, in contrast with the advice that a third science is useful in *Informed Choices*. (This is with the exception of Cambridge, which publishes favourable admission rates for those with at least three rather than only two science A-levels.)

Although entry to read law at Russell Group universities is considered very competitive, offer rates are considerably higher than for medicine/dentistry. Despite the fact that in contrast with medicine, law degrees require no essential subjects, facilitating A levels do indeed seem to be facilitating of entry, although their importance varies somewhat with the grade pattern. The chances of successful application drop off generally once any A level is held at grade B, but less so for students with more facilitating subjects. The patterns suggest that holding facilitating subjects can compensate for lower grades. It could be that admissions tutors in law consider the skills acquired in the study of subjects such as history and English mean that someone with a lower grade may be a more successful undergraduate than someone with other subjects that they believe do not confer such skills. But the majority of facilitating subjects taken by English school students are in maths and science, which suggests there might be other reasons for this favourable view. Previous evidence on subject difficulty, which has shown that most facilitating subjects are more difficult than most other subjects, may plausibly account for this compensation.

But what of A levels whose subject content might be considered particularly useful for university study? Russell Group law faculties either remain silent on the desirability or otherwise of having law A level, or describe themselves as neutral on admissions web pages. For students achieving at least an A, law A level is no more or less helpful than the same grade in any other subject. For those with B or below, law A level is associated with considerably lower offer rates than for a similar student without law (62 per cent rather than 76 per cent). These findings may explain some of the difference in the composition of the law student body between Russell Group and other universities as law is disproportionately offered by applicants from non-selective state schools and colleges (Dilnot, 2015). In the study of subject difficulty by Coe *et al.* (2008), law is ranked immediately below the two 'easiest' facilitating subjects, English literature and geography, and some way below languages and STEM subjects. It ranks just below average subject difficulty for all subjects, and is similar to or more difficult than most non-facilitating subjects, which suggests its difficulty is not the reason applications with it meet with less success. Perhaps a clue to the apparent unattractiveness of A-level law at lower grades can be found in research commissioned by the Office of Qualifications and Examinations Regulation (Ofqual) in preparation for the reform of A levels. Some tutors interviewed at highly selective universities felt subjects like law, psychology and computer science were undesirable as preparation for the related degree course as they resulted in students with the 'wrong type of understanding' and 'complacency' (Higton *et al.*, 2012: 38). Given the premium in offer rates relating to having facilitating A-level subjects, applicants to Russell Group law faculties might do well to take an extra facilitating subject, rather than law.

Finally, we consider the role of school type in being offered a place to read a competitive, vocational subject at a Russell Group university. Given that only A-level subjects, grades achieved and school type are in the model, the school type coefficients will effectively capture all the unobserved characteristics of students that vary on average by school type and are related to chances of being made an offer. For medicine and dentistry, A levels provide only one piece of evidence used by universities in making their decisions from a wide variety of assessments of both cognitive and non-cognitive skills. These skills are measured and scored by universities through attainment tests, GCSE scores, predicted (rather than achieved) A-level grades and subjects, personal statements, teacher references and interviews, but only data on achieved A levels and subjects are made available by UCAS. There is evidence that at least some of these

unobserved characteristics vary by school type: research on admission to highly selective universities outside medicine and dentistry suggests that once a rich set of attainment measures at GCSE are controlled for, the difference in participation between independent and grammar schools and non-selective local authority controlled schools disappears (Crawford, 2014). We know that much higher proportions of private school students gain at least five A*–C grades than non-selective local authority controlled school students (91 per cent rather than 39 per cent) (Crawford, 2014), so given the importance of GCSEs in scoring applications for medicine and dentistry, it would not be surprising if this omitted variable accounted for some of the difference by school type.

We know, too, that there is some differential in the accuracy of A-level grade prediction by school type, but it seems unlikely to be an important factor in explaining the gap given the relative unimportance of grades in the selection process, other than as a threshold. It is difficult to see how universities might screen out more students from non-selective state schools on this basis, given that if anything their predicted grades tend to be more optimistic, and should result in more students from state schools being shortlisted for interview.

It is more plausible to think that the quality of personal statements and teacher references may be a way in which private school students are at a particular advantage. Medical and dental schools are looking for particular non-cognitive skills. There is considerable information on their websites about these skills and the evidence that applicants might provide in their personal statements and teacher references to demonstrate them. It is time-consuming to check and see what is important for a particular course at a particular university. Private schools are likely to have considerably more resources to allocate to this. One of the ways students demonstrate non-cognitive skills in their personal statements is through the discussion of their work experience, and presumably the longer and more interesting the work experience, the better the personal statement can be. Better work experience opportunities may be available to more privileged students with wider social networks.

For law, A-level attainment is a more important in the selection of students by Russell Group departments than it is for medicine and dentistry. Once patterns of A-level attainment are taken into account in our models, the gap in offer rates between private school and non-selective state school pupils is barely significant at conventional levels. Previous work on university admission generally suggests that differentials in GCSE performance by school type (even if predicted A levels are the same) might

account for the remaining gap. The use of LNAT by a minority of Russell Group universities in these data may already be somewhat reducing the gap, but without access to the data it is not possible to judge.

Our analysis shows that having more facilitating subjects at higher grades is indeed associated with having a higher chance of admission to Russell Group universities to study medicine/dentistry and law, as the Russell Group argues, but that the mean differences in number and grades of facilitating subjects do not account for the admissions gap that is still observed between those applying for medicine and dentistry from private and both selective and non-selective state schools, nor fully for the smaller gap for law applicants from private and non-selective state schools. We have argued that this is not surprising for medicine and dentistry, given the large number of other pieces of evidence that are taken into account in evaluating applicants, and because for all applicants it is not possible to control for the achieved measures of prior attainment seen by university admission officers. We look forward to the provision of linkable UCAS data from 2017 onwards that will not only allow an analysis of applications and acceptances but will also allow measures of prior attainment, in particular GCSE scores, to be taken into account in assessing the fairness of admissions.

In the meantime, the findings presented in this chapter raise a number of points for consideration by government, by universities admissions policymakers and outreach coordinators, and by schools and colleges helping students prepare to apply to university. First, government policymakers should consider whether it is appropriate and fair to use of the percentage of students obtaining AAB or above at A level in two or more 'facilitating subjects' as a key performance indicator for schools and colleges. While it is the case that studying 'facilitating subjects' at A level leaves more degree course options open to students who are undecided about their disciplinary specialism at university, and while studying 'facilitating subjects' does appear to boost applicants' chances of university admission all other things being equal, 'facilitating subjects' cannot be uncritically championed as the 'best' subjects for all to pursue. Schools and colleges should be encouraged to signpost students to A-level subjects that they enjoy, are good at, and are likely to need (formally or informally) for the subjects they are considering studying at degree level. In many individual instances, the best three A-level subject choices for a given student may include only one 'facilitating subject' and possibly none at all. Moreover, in some schools and colleges, particularly those serving deprived communities, certain 'facilitating subjects' are simply not available as A-level options. As such, a more appropriate and fairer key performance indicator might be the

percentage of students studying subjects relevant to their intended degree subject area, whether these are 'facilitating subjects' or not. An alternative, halfway solution might be to change the key performance indicator from two 'facilitating subjects' to just one.

Related to this, although universities now typically declare on their websites and in prospectuses that A-level subjects are required or preferred for admission to particular degree courses, universities could do more to publicize the importance of A-level subject prerequisites, including through their outreach work with schools and colleges. Universities also need to do more to justify why certain A-level subjects are required or preferred for certain degree courses, noting that current reforms to all A levels are motivated, at least in part, by the aim that A-level subject content should meet the needs of students planning progression to a UK university 'particularly (but not only) in the same subject area' (Ofqual, 2014: 8). For 'preferred' A-level subjects, in particular, universities need to provide a clear rationale for their preferred status, based on empirical evidence confirming any claims made as to, for example, the better preparation such A levels provide for the degree course concerned. If an A level in a particular subject area, such as law, is not considered by universities to be good degree preparation in that subject, it should be made very clear on admissions pages. When making decisions about which A-level subjects are preferred and why, universities should also recognize that some A-level subjects are less readily available to students from disadvantaged backgrounds, and should consider widening the range of preferred subjects accordingly.

Finally, schools and colleges need to do more early on to ensure that their students choose A-level subjects that best serve their personal higher education ambitions. This is likely to be more challenging for stand-alone sixth form colleges and further education colleges than for sixth forms attached to secondary schools, where there is greater opportunity during the final year of GCSE study to offer detailed individual advice and guidance to students about the fit between A-level subject options and longer-term educational and career goals. The National Careers Service launched in 2012, and what remains of the Connexions advice and guidance service for young people, could help bridge this gap for young people attending schools without sixth form provision. In any case, schools, colleges, universities and advice and guidance services offered through the public and third sectors need to work together to ensure that prospective university students get the information and support they need. This is standard practice in independent schools, which are typically staffed by alumni of Russell Group universities.

Notes

[1] Our data include the 20 institutions that were members of the Russell Group during the admissions cycles 2010–12: Birmingham, Bristol, Cambridge, Cardiff, Edinburgh, Glasgow, Imperial, King's, Leeds, Liverpool, London School of Economics, Manchester, Newcastle, Nottingham, Oxford, Queen's Belfast, Sheffield, Southampton, University College London, and Warwick. Four more members joined in mid-2012: Durham, Exeter, Queen Mary, and York.

[2] In this study, applications to medicine and dentistry jointly are considered, because of the level of aggregation of data provided by UCAS. The admissions processes and required A-level subjects are very similar for the 11 Russell Group dental schools and for the medical schools in the data.

[3] We use the xtlogit command in Stata to take into account the fact that individual applicants make multiple applications, and the margins command to calculate marginal predicted probabilities of being offered a university place. All models control for year of application and particular institution applied to.

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